

# QNgine S-TRN

## PTP Slave for Intel Transcede Small Cells



### APPLICATIONS

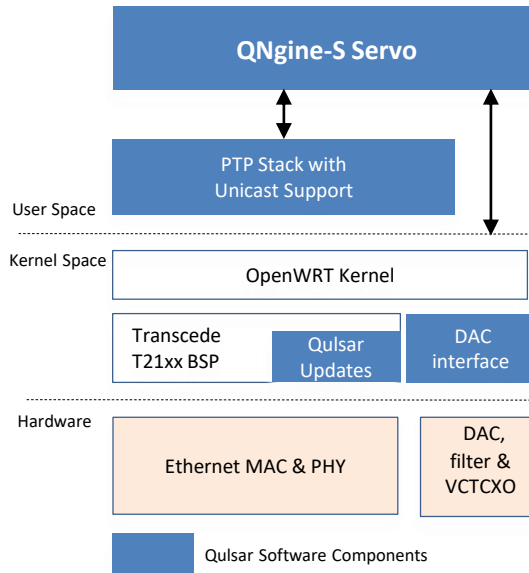
- Residential femtocells
- Enterprise small cells
- Pico/Macro cells
- LTE-FDD, LTE-TDD and LTE Advanced

### FEATURES

- Works with Intel T2000 and T3000-based platforms
- Provides full IEEE 1588-2008 (PTP) slave solution
- Industry-leading IEEE 1588 time & frequency recovery algorithms
- DAC control of VCTCXO or VCOCXO allows oscillator output to directly drive RF stage with very low phase-noise
- Supports unicast and multicast addressing
- PTP-over-Ethernet (layer 2) and PTP-over-UDP/IP (layer 3) operation
- Industry leading algorithm for phase recovery on noisy networks
- Compliant with ITU-T G.8265, G.8275.1 and G.8275.2 PTP profiles
- Frequency alignment to typically better than 10 ppb, and time alignment to better than 1.1  $\mu$ s over a five-hop, non-PTP aware, network
- Runs on top of existing real-time Linux kernel
- Configurable by application code
- Key-based node-locked licensing

### BENEFITS

- Easy & rapid integration in new and existing small cell designs
- Cost effective solution
- Provides time and frequency synchronization for air interface (LTE-TDD) and application layer (geolocation etc.)
- Fully compliant PTP stack and industry-leading advanced time-recovery servo provide functionality and performance beyond that of open-source solutions



QNgine S-TRN consists of an application-layer PTP solution supplied as an object library that the small cell vendor can integrate into their existing Linux environment, along with supplied kernel-space DAC drivers and necessary updates to the Intel Ethernet driver. An example application showing how to configure and control the PTP functionality is also supplied in source code form.

The PTP engine includes both a fully-compliant PTP stack, which implements the PTP protocol for communicating with a remote PTP master or boundary clock, and an advanced time-recovery servo that takes the timestamps generated by the PTP stack and uses these to align the tick rate and time of the small cell to match that of the master to within a high degree of accuracy. The PTP function uses the timestamping and 1PPS (pulse per second) capabilities of the Intel Transcede SOC and achieves time and frequency alignment by adjusting the frequency of the system's voltage-controlled master oscillator. This allows the oscillator to drive the RF stage while meeting both phase noise and frequency accuracy requirements.

By default, QNgine S-TRN will operate with little or no modification on small cell designs based around the Grandtelco FC81RTL Intel T2000 small cell reference design with discrete 12-bit DAC for oscillator control. However, operation with similar T2000 and T3000-based designs is typically also possible with customized porting of QNgine S-TRN.

QNgine S-TRN pricing is structured on the basis of a one-off design license fee, a nominal per-unit royalty and an optional annual maintenance agreement providing ongoing support and access to product enhancements. Any customization effort needed to operate on a non-standard small cell design is additional to the initial design license and priced based on required effort. As part of the design license fee, Qulsar will provide assistance with integrating QNgine S-TRN on the host small cell and conduct in-house functionality and performance testing, including providing a detailed performance test report.